and female chromosomes were shifted about in such a way that some of both kinds were diverted to each pole.

5. The two most important theoretical considerations noted, are, first, that the nucleus can no longer be considered as taking the initiative in the work of cell-fusion but this must be given back to the protoplasm from which the directive spheres are formed. The nuclei are but passive parcels of hereditary substance transmitted from one cell to another and always under the dynamic control of the spheres. Second, the male and female sexual cells transmit the same number of chromosomes and thus indicate that they have an equivalent part in the heredity and that the view that the male is merely a stimulant or irritant under which the female nucleus takes on the character of a segmentation nucleus is not supported by the facts of morphology in the case in hand.

The article is given a fitting close by ten of those plates which are made nowhere but in Paris. In them one can follow with the greatest ease the investigations of the author and alone they constitute no mean addition to the literature of mitosis.—CONWAY MACMILLAN.

Burnt spots on leaves.[1]

It is a well known fact, that the green parts of plants, especially the leaves, may show local or partial decolorations, due to different factors. We do not speak of the decoloration which is generally referred to chlorosis or etiolation, but of the yellow, brown or perfectly black spots which are not uncommon upon the leaves of plants kept in greenhouses. Such spots may be due to parasitic animals or plants or to inorganic agents. In the last case they are characterized as "burnt spots." This disease has been recorded in literature long ago. Burnt spots have been attributed to several pathological changes, which, although they showed great similarity to those caused by a relatively high temperature, nevertheless originated from quite different factors.

One of the oldest theories to account for these, and as it seems the only acceptable one, was that which ascribed them to the common presence of air-bubbles in the glass used as cover for green-houses. The air-bubbles were supposed to have

[1] JÆNSSON BENGT: Om brænnflæckar paa vextblad. Botaniska Notiser. Lund 1891. 30 pp. 2 colored plates.

the effect of lenses, by which the sunlight became concentrated and thereby caused a burning of the exposed parts of the leaves. Another theory, quite generally adopted, was that drops of water left on the leaves after they had been watered, might have the same effect as lenses or by their own heat be able to burn the leaves, especially in houses without sufficient ventilation.

De Candolle suggested that the burning might be caused by the drops of water, which at once softened the tissue of the leaves, became heated in the sunlight and thereby prevented evaporation. In *Gardener's Chronicle* for 1858 burnt spots on orchids were said to originate from too much moisture in connection with too low temperature.

The explanation most commonly adopted, however, is that which attributes the effect to drops of water having been heated by the sunlight and it has been so recorded in the more prominent phytopathological manuals. Sorauer for instance in his *Pflanzenkrankheiten* explains the fact quite briefly by this statement. Neumann[1] came to the same conclusion by some experiments he made with *Cordyline*. On the other hand he observed that if the leaves were fastened in a certain position they were burnt even if there was sufficient draught. Another author, who has almost adopted the same theory, is Frank[2], although he does not exclude the possibility that the drops of water might also be able to act as lenses. And he found support in Hoffmann who was the first to show, by experiments on grapes, that drops of water in a hanging position are able to concentrate the sunlight and to produce burning. Later von Thümen[4] expressed full accordance with Hoffmann. But the old theory, that the burnt spots were caused by air-bubbles in the glass, seems to have been entirely abandoned, although Neumann (l. c.) was not quite unaware of the possibility of its correctness; he did not believe, however, that such air-bubbles could burn except through very short distances.

The author of the present paper calls attention to the fact that the true burnt-spots are easily distinguished by their

[1] Adansonia, Vol. II, 1862, p. 312.

[2] Die Krankheiten der Pflanzen, 1880, p. 174.

[3] Samenbruch bei der Weinbeere, Botan. Zeitung 1872, p. 113.

[4] Ueber den Sonnenbrand der Rebenblætter, Die Weinlaube 1886, p. 409.

most frequently elliptical form with the longest diameter often from east to west, and if they occur several together on one leaf, they form always longitudinal rows from east to west, the spots in the middle being the largest. He has made a series of experiments so as to test the different theories, which have been enumerated above. It has been thereby proved, that drops of water are unable to cause any kind of burning by their own heat. Further, as shown by Sachs, the vegetative cell of land-plants is able to stand a heat of 51° C. All the experiments, made by the author in that direction, gave negative results, so that Neumann's theory cannot be correct. Some experiments were made with water of a temperature above 60° C., but even this did not affect the leaves.

As regards the supposition, that drops of water might have the same effect as lenses, it is quite clear that drops which have fallen on leaves merely represent half-lenses, a fact to which already De Candolle has called attention. And it is shown by experiments, that only when the drops of water were out of contact with the leaves, do they become able to cause a kind of burning, for instance when hanging down from the inside of a glass cover.

The author has come to the conclusion that in most cases the burnt spots are due to the poor quality of the covering glass, by the air bubbles of which the sunlight becomes concentrated so as to produce a burning on the leaves.—THEO. HOLM.

BRIEFER ARTICLES.

Cleistogamy in the genus Polygonum.—On page 273, vol. XVI, BOTANICAL GAZETTE, it is noted that "Mr. Thomas Meehan has found cleistogamous flowers in abundance on *Polygonum acre* and suspects the same habit in other species." On page 314 of the same volume of the GAZETTE, Mr. T. H. Kearney, Jr., records his observation of cleistogamous flowers upon *Polygonum acre* at Knoxville, Tenn., accompanying his note with figures. Mr. Kearney farther states that he has "searched for cleistogamic flowers on other species of Polygonum without success."

I am led by the appearance of these notes to state that in my studies of the genus Polygonum, I have found cleistogamous flowers